Paper No. 24

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte HOMER ANTONIADIS,
MICHAEL INBASEKARAN,
and
EDMUND P. WOO

_____

Appeal No. 2002-0429
Application No. 08/847,138

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ON BRIEF

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Before GARRIS, PAK, and MOORE, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge.*

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 30-32. Claim 1 has been canceled and claims 2-29 are allowed. Thus, only claims 30-32 are before us on this appeal.

REPRESENTATIVE CLAIM

30. An OLED comprising:

a cathode comprising a first conductive layer;

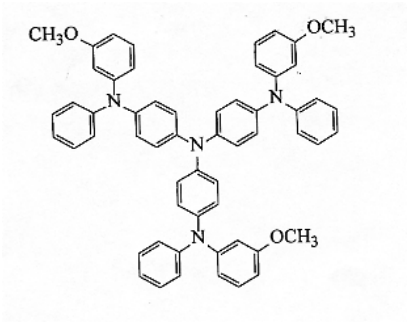
an electroluminescent layer comprising an oxadiazole, thiadiazole or triazole compound, said oxadiazole, thiadiazole or triadiazole compound emitting light when holes and electrons recombine therein;

an anode comprising a second conducting layer, wherein said anode is transparent to light generated by said electroluminescent layer; and

a hole transport layer, said hole transport layer being sandwiched between said electroluminescent layer and said anode, said hole transport layer comprising a hole transport compound having an energy band intermediate between that of said anode and that of said electroluminescent layer,

wherein said anode comprises first and second anode layers, said first anode layer comprising indium tin oxide and said second anode layer comprising a material that bonds to indium tin oxide and to said hole transport layer better than said hole transport compound binds to indium tin oxide and which has an energy band intermediate between that of indium tin oxide and said hole transport, layer, said second anode layer being sandwiched between said hole transport layer and said first anode layer.

31. The OLED of claim 30 wherein said second anode layer comprises



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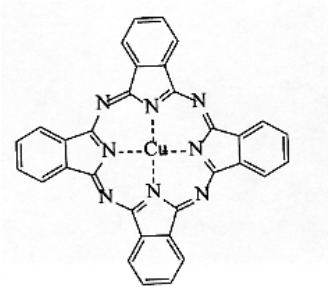
32. The OLED of claim 30 wherein said second anode layer comprises



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The References

In rejecting the claims under 35 U.S.C. § 103(a), the examiner relies upon the following references:

Mori et al. (Mori)	5,281,489	Jan. 25, 1994
Egusa et al. (Egusa)	5,343,050	Aug. 30, 1994
Ito et al. (Ito)	5,652,067	Jul. 29, 1997
Arai et al. (Arai)	5,981,092	Nov. 09, 1999

The Rejections

Claims 30-32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori in view of Egusa, Ito, and Arai.

The Invention

The invention relates to an organic light emitting diode (OLED). The diode construct is a series of layers including a cathode, an electroluminescent layer, a hole transport layer, and a transparent anode. (Appeal Brief, page 2, lines 4-6).

The Rejection of Claims 30-32 Under 35 U.S.C. § 103 (a)

The examiner has found that Mori discloses a multilayered electroluminescent device having an anode, a hole transport layer, an electroluminescent layer, an electron transport layer, and a cathode. The examiner has further found that Mori teaches that the hole transport layer and electron transport layer may be made of multiple sublayers, and Mori's hole transport layer is the same as the instantly claimed second anode layer. (Examiner's answer,

page 5, lines 6-15). The examiner has also taken Official Notice that the compounds of claims 31 and 32 are known in this art. (Id., page 4, lines 18-19). The examiner has further found that Egusa teaches using multiple hole injecting/transport layers with different ionization potentials, increasing from anode to emitting layer (Examiner's answer, page 5, last line - page 6, line 4). Finally, the examiner has found that Ito and Arai teach that improvement of adhesion in an electroluminescent device improves performance (Examiner's Answer, page 6, lines 4-7)

The examiner then concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to make an electroluminescent device comprising a multilayered hole transporting layer wherein the hole transporting layer in contact with the indium tin oxide (ITO) anode comprises the compounds of claims 31 and 32. One would have been motivated, it is reasoned, by Mori's teachings that the hole injecting or transporting layer may be multilayered and comprised of a hole moving and donating agent, and because the specific compounds of claims 31 and 32 are either explicitly disclosed or known in the art and the multilayered hole injecting and transport layer is taught. (Examiner's Answer, page 5, lines 6-16).

The appellants, on the other hand, assert that even if the combined references suggest optimizing the progression of energy

levels and the adhesion of the bottom hole transport layer, there is no reasonable expectation based on the cited prior art that a hole transport sub-layer can be found that has both an energy band between that of the hole transport layer above it and the anode, and also binds to the ITO layer below it better than the hole transport layer above it in the stack would. At best, it is urged, the references teach that both adhesion and progression of energy levels from the anode toward the light-emitting layer are important properties. (Appeal Brief, page 3, lines 16-22).

Initially, we note we disagree with the premise of this argument. First, as discussed infra, Mori teaches multiple layer transport layers and the use of copper phthalocyanine against an ITO layer. The claimed improved adhesion and energy band features are said by the appellants to be accomplished by copper phthalocyanine (claim 33). As copper phthalocyanine is a known hole transport layer[1], we find that these claimed properties would necessarily and inevitably flow from its use. Accordingly, we are not persuaded by this argument.

The appellant also urge that there are over 1000 possible candidates for each hole transport layer and second anode layer. Exploring over 1,000,000 combinations for adhesion properties is said to hardly be routine experimentation (Reply Brief, page 1,

lines 6-13). We disagree with this argument as well. First, the art suggests one of the selections to be made (copper phthalocyanine). Second, that the cited art discloses a multitude of effective combinations does not render any particular formulation less obvious.

This is especially true because the claimed composition is used for the identical purpose taught by the prior art. See In re Corkill, 771 F.2d 1496, 1500, 226 USPQ 1005, 1008 (Fed. Cir. 1985) (obviousness rejection of claims affirmed in light of prior art teaching that "hydrated zeolites will work" in detergent formulations, even though "the inventors selected the zeolites of the claims from among 'thousands' of compounds"); In re Susi, 440 F.2d 442, 445, 169 USPQ 423, 425 (CCPA 1971) (obviousness rejection affirmed where the disclosure of the prior art was "huge, but it undeniably include[d] at least some of the compounds recited in appellant's generic claims and it is of a class of chemicals to be used for the same purpose as appellant's additives"). Finally, there simply is no proof whatsoever that there are "thousands" of potential lab transport candidates.

The appellants also urge that the examiner has selected two references and combined them with the benefit of the present application, and one of ordinary skill in the art at the time the

1 Mori, column 42, example 63.

invention was made would not have done so. (Reply Brief, page 2, lines 5-9).

Our independent review of the cited references leads us to agree with the examiner, and not the appellants, in that the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made. We make the following observations and findings of fact, in tabular form for convenience of reference:

Claim element	Teaching of Mori, Egusa with Citation
30. An OLED comprising:	Mori teaches organic LED (column 3, lines 26-27)
a cathode comprising a first conductive layer;	Mori teaches a cathode for injecting electrons (column 3, lines 25-26) of metal (column 28, lines 59-62)
an electroluminescent layer comprising an oxadiazole, thiadiazole or triazole compound, said oxadiazole, thiadiazole or triadiazole compound emitting light when holes and electrons recombine therein;	Mori teaches an electroluminescent layer (column 4, lines 8-11) which may include an oxadiazole hole-moving element (column 4, lines 42-43)/
an anode comprising a second conducting layer, wherein said anode is transparent to light generated by said electroluminescent layer; and	Mori discloses a conducting anode which may be transparent (column 28, lines 47-50)
a hole transport layer, said hole transport layer being	Mori discloses a hole transport layer between the

sandwiched between said electroluminescent layer and said anode, said hole transport layer comprising a hole transport compound having an energy band intermediate between that of said anode and that of said electroluminescent layer, wherein said anode comprises first and second anode layers, said first anode layer comprising indium tin oxide and said second anode layer comprising a material that bonds to indium tin oxide and to said transport hole better than said hole transport compound binds to indium tin oxide and said hole transport layer, said second anode layer being sandwiched between said hole transport layer and said first anode layer.	electroluminescent layer and the anode (Column 29, lines 10-14). Egusa teaches it is preferable to have low barrier heights in an organic electroluminescent device for hole and electron injection (abstract, column 17, lines 14-47) Mori discloses that the anode may be ITO (column 28, line 52). Mori also discloses the use of multiple layer hole injection layers (column 29, lines 44-49) and the use of copper phthalocyanine as a hole transport layer (example 63, column 42, lines 60-65) which is part of the anode. This layer is between the ITO and any upper layer when there are multiple layers. (column 2, lines 44-49).

Further, the appellants have not focused any attention on the examiner's findings regarding Mori's example 63. We, like the examiner, find that this example discloses the claimed first anode of transparent indium tin oxide (column 3, lines 27-28), covered with a second anode layer comprising copper phthalocyanine (column 42, lines 60-65), an electroluminescent layer using a thiazole (column 40, lines 61-63), a hole inhibiting layer, and a cathode (column 43, lines 1-9). The provision of the hole injecting and transport layer and the hole inhibiting layer are said to increase

efficiency. (Id.) While this example does not teach the multiple layers suggested earlier in the reference, it clearly exemplifies a known layer of copper phthalocyanine, which is said in claim 33 to have the properties of claim 31.

Accordingly, we agree with the examiner that one of ordinary skill in the art would have been motivated to use a multiple layer hole transport layer, and the layer adjacent the anode to be copper phthalocyanine (claim 32), which inherently has the claimed properties of adhesion and energy band (claim 30). Further, the examiner has found that the 4, 4', 4"-tris[N-(3-methoxyphenyl-N-phenylamino]triphenylamine is also known in the art as a hole transport material (Examiner's Answer, page 5, lines 13-14). The appellants have not challenged these findings of fact. Consequently, the conclusion that it would have been obvious has ample evidentiary support. Accordingly, we affirm this rejection.

Summary of Decision

The rejection of claims 30-32 under 35 U.S.C. § 103(a) over Mori in view of Egusa, Ito, and Arai is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

BRADLEY R. GARRIS Administrative Patent Judge	)	
CHUNG K. PAK Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JAMES T. MOORE Administrative Patent Judge	)	

JTM/ki

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